

REMARKS

In the Office Action¹, the Examiner objected to claim 20 due to informalities; rejected claims 1, 3, 4, 6, 7, 9, 13, and 15 under 35 U.S.C. § 103(a) as being unpatentable over Mashino et al. (U.S. Publication No. 2002/0190375 A1, hereafter “Mashino”) in view of Mayuzumi (U.S. Publication No. 2002/0079525, hereafter “Mayuzumi”); rejected claims 2, 5, 8, and 14 under 35 U.S.C. 103(a) as being unpatentable over Mashino in view of Mikawa et al. (U.S. Publication No. 2002/0115226 A1, hereafter “Mikawa”); rejected claims 10 and 12 under 35 U.S.C. 103(a) as being unpatentable over Mashino in view of Mayuzumi and Mayashita et al. (U.S. Publication No. 2001/0045605 A1, hereafter “Mayashita”); rejected claim 11 under 35 U.S.C. 103(a) as being unpatentable over Mashino in view of Mikawa and Mayashita; rejected claims 16 and 18-20 under 35 U.S.C. 103(a) as being unpatentable over Mashino in view of Mayuzumi and Koga (U.S. Publication No. 2002/0079492 A1, hereafter “Koga”); and rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Mikawa and Koga. By this Amendment, Applicant cancels claims 1 and 3; amends claims 4, 6, 7, 9, 10, 12, 13, 15, 16, and 18-20; and adds new claim 21. Thus, claims 2 and 4-21 are pending.

Applicant has amended claims 7, 9, and 20 to more clearly reflect the nature of the present invention. Claims 7 and 9 are rewritten such that these claims are now independent claims. Claims 4, 6, 10, 12, 13, 15, 16, and 18-19 are amended to reflect

¹ The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

their new claim dependence, in light of the cancellation of claims 1 and 3, and the changes to claims 7 and 9. Claim 21 has been added to set forth additional aspects of the present invention.

Applicant respectfully traverses the objection of claim 20. Amended claim 20 depends upon amended claim 9. The semiconductor device recited in claim 9 includes a plurality of semiconductor chips; at least one of the plural semiconductor chips including:

a through plug formed to be partly surrounded by the insulation film without being in contact with the plural diffusion layer patterns and to pass through the insulation film and the semiconductor substrate, the through plug being partly surrounded also by the pattern portion above the diffusion layer pattern and/or the insulation film and being insulated from the pattern portion, or a through plug formed to be partly surrounded by the diffusion layer pattern without being in contact with the insulation film and to pass through the diffusion layer pattern and the semiconductor substrate

(emphasis added).

The claimed semiconductor device therefore includes a semiconductor chip having a former or latter "through plug," as recited in claim 9.

Claim 20 recites a semiconductor device as set forth in claim 9, wherein the through plug is formed to be partly surrounded by the insulation film without being in contact with the plural diffusion layer patterns and which passes through the insulation film and the semiconductor substrate. Claim 20 further recites that the through plug is partly surrounded also by the pattern portion above the diffusion layer pattern and/or the insulation film, and is insulated from the pattern portion.

Therefore, claim 20 recites a through plug which corresponds to the former "through plug," recited in claim 9. Accordingly, the recitation of:

the through plug is formed to be partly surrounded by the insulation film without being in contact with the plural diffusion layer patterns and to pass through the insulation film and the semiconductor substrate, the through plug being partly surrounded also by the pattern portion above the diffusion layer pattern and/or the insulation film and being insulated from the pattern portion

are not redundant from claim 9, but necessary in order to clarify which through plug is claimed. Accordingly, Applicant respectfully requests that the Examiner withdraw the objection of claim 20.

Applicant respectfully traverses the rejection of claims 1, 3, 4, 6, 7, 9, 13, and 15 under 35 U.S.C. § 103(a) over Mashino in view of Mayuzumi. To establish a *prima facie* case of obviousness, three basic criteria must be satisfied. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine references. Second, there must be a reasonable expectation of success. Third, the prior art reference (or references when combined) must teach or suggest all of the claim elements. See M.P.E.P. § 2143. Moreover, the requisite teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). See M.P.E.P. § 706.02(j). Applicant respectfully traverses the rejection of claim 7 as Mashino and Mayuzumi fail to teach or suggest each and every element present in the claim, and because the references fail to provide a motivation or suggestion to be combined in the manner proposed by the Examiner.

Claim 7 recites a semiconductor device including “a through plug formed to be partly surrounded by the insulation film without being in contact with the plural diffusion layer patterns and to pass through the insulation film and the semiconductor substrate.” Claim 7 further recites a “through plug being partly surrounded also by the pattern portion above the diffusion layer pattern and/or the insulation film.” In addition, claim 7 includes “an insulation film formed between the plural diffusion layer patterns on the semiconductor substrate to isolate the plural diffusion layer patterns from one another.”

The Examiner concedes that Mashino fails to teach a “plug . . . partly surrounded by an insulating film formed on the substrate.” Office Action at page 3. However, the Examiner asserts that Mayuzumi teaches “a plug (Fig. 7, 8a and 12d) formed to be partly surrounded by the insulating film (Fig. 7, 9) without being in contact with the plural diffusion layer patterns.” Id. The Examiner further asserts that Fig. 7 of Mayuzumi teaches the claimed “insulation film formed between the plural diffusion layer patterns (Fig. 7, 15).” Id. Applicant respectfully disagrees.

Applicant respectfully submits that elements 8a and 12d taught by Mayuzumi in Fig. 7 do not constitute the claimed “through plug.” Claim 7 requires that the through plug is formed “to pass through the insulation film and the semiconductor substrate.” Mayuzumi does not teach a through plug, and instead teaches “contact hole 12d reaching the gate electrode 8a alone,” as discussed, for example, at page 3, paragraph [0039]. Thus, the contact hole 12d and gate electrode 8a do not “pass through the insulation film and the semiconductor substrate,” as required by claim 7. Accordingly, the contact hole 12a and gate electrode 8a cannot constitute the “through plug,” recited in claim 7.

Furthermore, even assuming *arguendo* that contact hole 12d and gate electrode 8a did correspond to the claimed “through plug,” (which Applicant submits is not the case) Mayuzumi neither discloses nor suggests that contact hole 12d and gate electrode 8a are formed to be partly surrounded by “an insulation film formed between the plural diffusion layer patterns on the semiconductor substrate to isolate the plural diffusion layer patterns from one another,” (emphasis added) as recited in claim 7.

At, for example, page 3, paragraph [0036], Mayuzumi discloses that oxide film 15 is formed “for element isolation.” Fig. 7 of Mayuzumi therefore discloses contact hole 12d and gate electrode 8a are formed on oxide film 15, and through interlayer insulating film 11. Mayuzumi also teaches for example, in Fig. 7, and paragraph [0034], insulating films 2 and 3, which constitute sidewall 9 are formed on top of silicon substrate 1. However, Mayuzumi does not teach or suggest that sidewall 9 is formed to “isolate the plural diffusion layer patterns from one another,” as recited in claim 7.

Accordingly, to the extent that oxide film 15 corresponds to “an insulation film formed between the plural diffusion layer patterns . . . to isolate the plural diffusion layer patterns from one another,” and to the extent that contact hole 12a and gate electrode 8a allegedly correspond to the claimed “through plug,” Fig. 7 of Mayuzumi clearly fails to show a “through plug formed to be partly surrounded by the insulation film,” as recited in claim 7. Instead, Mayuzumi discloses contact hole 12d and gate electrode 8a are formed through and is surrounded by an interlayer insulating film 11, and formed on element isolation oxide film 15. Applicant respectfully submits therefore that Mayuzumi fails to teach “a through plug formed to be partly surrounded by the insulation film.”

where the “insulation film formed between the plural diffusion layer patterns on the semiconductor substrate,” as recited in claim 7.

Accordingly, Mashino and Mayuzumi, neither alone nor in combination, teach or suggest “an insulating film,” and “a through plug,” as recited in claim 7. Claim 7 is therefore allowable over Mashino and Mayuzumi for at least these reasons.

In addition, the Examiner must present a line of reasoning as to why the artisan viewing only the collective teachings of prior art would have found it obvious to pick and choose various elements and/or concepts from the references relied on to arrive at the claimed invention. See *Ex parte Clapp*, 227 USPQ 972 (Bd. Pat. App. & Inter. 1985). M.P.E.P. § 2143.01 states that “[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination” (emphasis added).

Here the Examiner has not provided a motivation or suggestion from Mashino and Mayuzumi, except to make general statements that “it would have been obvious . . . to realize transistor circuits” (Office Action at page 3) to combine the references in the suggested manner. However, this broad generalization does not constitute a suggestion of the desirability of the proposed combination from the prior art. Accordingly, a *prima facie* case of obviousness is not established based on Mashino and Mayuzumi, at least due to the fact that the references fail to provide a suggestion or motivation for the proposed combination. Claim 7 is therefore not obvious in view of Mashino and Mayuzumi for at least this reason.

At least due to the above discussed reasons, claim 7 is allowable. Claim 9 recites limitations similar to those recited in claim 7, and is therefore allowable for at

least the same reasons as claim 7. In addition, claims 4 and 13, and claims 6 and 15 respectively depend from independent claims 7 and 9. Accordingly, these dependent claims 4, 6, 13, and 15, incorporate each and every element recited by corresponding claims 7 and 9, and are not obvious in view of Mashino and Mayuzumi for at least the same reasons as claim 7. Applicant has cancelled claims 1 and 3, rendering the Examiner's rejection of these claims moot. Thus, Applicant respectfully requests that the Examiner reconsider, and withdraw the rejection of claims 1, 3, 4, 6, 7, 9, 13, and 15 under 35 U.S.C. § 103(a).

Applicant respectfully traverses the rejection of claims 10 and 12 as being unpatentable over Mashino, Mayuzumi, and Mayashita. Claims 10 and 12 respectively depend from independent claims 7 and 9, and therefore incorporate each and every element of their corresponding independent claims. As discussed above, Mashino and Mayuzumi fail to teach or suggest at least a "through plug formed to be partly surrounded by the insulating film," as recited in claims 7 and 9, and required by claims 10 and 12. Mayashita fails to cure the deficiencies of Mashino and Mayuzumi. Specifically, Mayashita is drawn to an MIS structure (paragraph [0001]), but fails to teach a "through plug," as recited in claims 7 and 9, and required by claims 10 and 12. Since Mashino, Mayuzumi, and Mayashita, taken alone or in combination, fail to teach or suggest each and every element required by claims 10 and 12, no *prima facie* case of obviousness has been established. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claims 10 and 12.

Applicant respectfully traverses the rejection of claims 16 and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Mashino, Mayuzumi, and Koga. Claims 16

and 18-20 depend from corresponding independent claims 7 and 9. Accordingly, these dependent claims incorporate each and every element of their corresponding independent claims 7 or 9. As set forth above, Mashino and Mayuzumi fail to teach at least a “through plug formed to be partly surrounded by the insulating film,” as recited in claims 7 and 9, and required by claims 16 and 18-20.

Koga discloses, for example, in Fig. 3, a wiring electrode 113 in contact hole 112, that is surrounded by stopper film 109, and is formed directly on source and drain region 108. Koga fails however to teach or suggest “a “through plug formed to be partly surrounded by the insulation film,” (emphasis added) where the “insulation film [is] formed between the plural diffusion layer patterns . . . to isolate the plural diffusion layer patterns from one another,” as recited in claims 7 and 9. Thus Koga fails to cure the deficiencies of Mashino and Mayuzumi. Accordingly, no *prima facie* case of obvious is established based on the Examiner’s proposed combination of Mashino, Mayuzumi, and Koga, at least due to the fact that the references, either alone or in combination, fail to teach or suggest the claimed “through plug,” as recited in claims 7 and 9, and required by claims 16 and 18-20. Applicant therefore requests that the Examiner reconsider, withdraw the rejection under U.S.C. § 103(a) and allow claims 16 and 18-20.

Applicant respectfully traverses the rejection of claims 2, 5, 8, and 14 under 35 U.S.C. 103(a) as being unpatentable over Mashino in view of Mikawa. Claim 2 recites “a semiconductor substrate,” including an “insulation film formed between the plural diffusion layer patterns on the semiconductor substrate . . . a through plug formed to be partly surrounded by the diffusion layer pattern . . . to pass through the diffusion layer pattern and the semiconductor substrate.”

The Examiner again admits deficiencies of Mashino, and relies on Mikawa to teach “an insulating film . . . [and] plug.” Office Action at page 5. Applicant respectfully disagrees.

In Fig. 1, Mikawa discloses heavily doped diffusion layers 11a, isolation insulation films 12 formed between heavily doped diffusion layers 11a, and contact plug 14, as described, for example, in paragraphs [0043]-[0045]. However, Mikawa fails to teach or suggest that contact plug 14 is formed to be partly surrounded by diffusion layer 11a. Instead contact plug 14 is formed on diffusion layer pattern 11a, as shown, for example, in Fig. 1 of Mikawa. Furthermore, contact plug 14 fails to “to pass through the diffusion layer pattern and the semiconductor substrate,” as required by claim 2, and thus does not constitute the claimed “through plug.”

Accordingly, to the extent that contact plug 14 corresponds to the “through plug,” recited in claim 2, Mikawa fails to teach or suggest a “through plug formed to be partly surrounded by the diffusion layer pattern . . . and to pass through the diffusion layer pattern and the semiconductor substrate.” Given the Examiner’s reliance on Mikawa, the Examiner appears to concede that Mashino also fails to teach or suggest at least this element. Accordingly, claim 2 is not obvious based on Mashino and Mikawa, and is therefore allowable over the cited prior art, for at least this reason.

Similar to the reasons set forth with respect to claim 7, the Examiner also fails to provide a reason why one of ordinary skill in the art would be motivated to combine the references in the manner suggested by the Examiner. The Examiner has not set forth any specific teaching from Mashino and Mikawa which suggest the desirability of the combination proposed by the Examiner. Accordingly, a *prima facie* case of obviousness

is not established based on Mashino and Mikawa for at least this reason, and claim 2 is allowable over the references.

For at least the reasons set forth above, claim 2 is allowable over Mashino and Mikawa. Claims 5, 8, and 14 depend from claim 2, and accordingly incorporate each and every element of claim 2. Thus, these dependent claims are also allowable over Mashino and Mikawa for at least the same reasons as claim 2. Accordingly, Applicant respectfully requests that the Examiner therefore reconsider and withdraw the rejection of claim 2, 5, 8, and 14.

The Examiner rejected claim 11 under 35 U.S.C. § 103(a) based on Mashino, Mayuzumi, and Mayashita. As discussed above, Mayashita fails to teach or suggest a “through plug,” as recited in claim 2 from which claim 11 depends. Mayashita therefore fails to cure the deficiencies of Mashino and Mayuzumi. Claim 2 is thus not obvious over the Examiner’s proposed combination of Mashino, Mayuzumi, and Mayashita. Claim 11, which depends from claim 2, is also not obvious for the same reasons set forth with respect to claim 2. Applicant respectfully requests that the Examiner withdraw the rejection of claim 11.

Applicant respectfully traverses the rejection of claim 17 over Mashino, Mikawa, and Koga. Claim 17 depends from claim 2, and accordingly incorporates each and every element recited in claim 2. Claim 17 is allowable over Mashino and Mikawa, for at least the same reasons as discussed above with respect to claim 2. Koga, as discussed above, does not disclose a “through plug formed to be partly surrounded by the diffusion layer pattern . . . and to pass through the diffusion layer pattern and the semiconductor substrate,” as recited in claim 2. Koga thus fails to cure the deficiencies

of Mashino and Mikawa, with respect to claim 2. Claim 17 is therefore allowable over Mashino, Mikawa, and Koga, at least due to its dependence from claim 2. Accordingly, Applicant respectfully requests that the rejection of claim 17 be withdrawn.

New claim 21 depends from claim 2. Accordingly, claim 21 incorporates each and every element of claim 2, and is allowable over the cited prior art for at least the same reasons as independent claim 2. Thus, Applicant respectfully requests allowance of claim 21.

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,
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